125 Feasibility of carrying out spirometry in 3 and 4 year old children in a standard clinic setting

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Objectives: We used to introduce spirometry to 5 year old (yo) children with the aim of having reliable results by the age of 6. In 2009 we attempted this with 4yos. In 2011 a 2.5yo girl was keen to copy her 4yo sibling so was allowed to try spirometry simply to avoid conflict. Since she made a reproducible effort we decided to attempt this in all 3yos.
Methods: Spirometry was carried out in clinic by the physiotherapist who knew which blowing techniques the children had learned during airway clearance, such as bubble PEP. A CareFusion MicroLab spirometer was used with the child incentive. Children aged 3 with good comprehension attempted the test. The parents understood the potential unreliability of the test. The children were asked to perform one long blow similar to blowing out birthday candles. The reaction of the incentive cartoon was explained. The flow-volume loop was checked between blows and further explanation given if necessary. The best of 3 attempts was recorded.
Results: Some children took a second breath and others did not complete the blow, particularly after the incentive was met. During successive visits this usually improved. Overall 9 of 10 3–4yos produced reproducible results, 5 of whom had useful results at age 3. Several children have had these repeated on multiple clinic visits showing good lung growth with age.
Conclusion: We have demonstrated that it is feasible during normal appointments to undertake reproducible spirometry in a significant proportion of children as young as 3. With the new global lung initiative normal ranges extending to younger age groups we will be able to make an earlier start in following individual trends in lung function.

126 What factors determine lung function decline in Polish CF children?

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Objectives: It seems that the severity of lung disease in children with cystic fibrosis (CF) could depend on the type of mutation in the cystic fibrosis transmembrane conductance regulator gene (CFTR). However, there is wide variability in course of disease, even among patient presented the same mutation. This fact reflects the influence of multiple factors such environmental, bacterial colonization and methods of treatment on the disease.
Aim: To identify risk factors that modify the disease in children suffered from CF.
Methods: The follow-up time was at least 5 years of respiratory status observation based on FEV1. The socio-economic data, perinatal interview, time of CF diagnosis and introduction of standard therapy including tobramycin inhalation solution (TIS), chronic colonization including *Pseudomonas aeruginosa* (PA) and number of exacerbations and hospitalizations were assessed.
Results: The mean age of 46 included children was 12.3±7.4 years. Delta F508 homozygous were detected in 42.9%. The most significant predictors related to the decline of FEV1 were PA chronic colonization (OR: 1.01, 95% CI: 1.00–1.02; $p = 0.0165$) and late TIS initiation after first detection of PA (OR: 1.02, 95% CI: 1.00–1.03; $p = 0.0071$). A logistic regression analysis confirmed the independence of other demographic and clinical variables as predisposing factors in lung function decline.
Conclusion: Our study reviled that chronic PA colonization and late TIS initiation after first detection of PA are at risk of pulmonary decline in CF children. Above results strongly suggest that in order to be maximally effective, TIS treatment should begin early after first detection of PA.

127 Improving the multiple breath washout test: closed circuit washin with a novel bolus gas delivery system substantially reduces washin time and does not alter washout

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Objectives: Multiple breath washout (MBW) using the inert tracer gas SF_6 is a sensitive measure of early airway dysfunction in CF. A potential disadvantage of using an exogenous tracer is the additional time required to wash the SF_6 into the lungs. This report describes a novel bolus washin methodology that substantially improves washin time.
Methods: All tests were performed sequentially on the same fast-responding Innocor MBW system. Washin was performed using 0.2% SF_6 in an open circuit, 1% SF_6 in a rebreathe (closed) circuit and 1% SF_6 in a closed circuit using a bolus technique to deliver all tracer in the first part of the first inspiration. All tests were performed in triplicate on healthy controls. A CO_2 scrubber was used for closed circuit tests.
Results: Paired data are available on 10 controls (mean age 36 yrs, 3M, Mean FEV_1 102%). There was no difference in LCI (Mean 6.69, 6.76, 6.68 with open, closed and bolus closed systems, $p = 0.88$) or FRC (2.80, 2.79, 2.80 L, $p = 0.99$) between washin methods. Washin (analysed to inspired:expired ratio <2%) took a mean of 34 breaths (163 s) with open circuit vs 13 breaths (61 s) with closed circuit and 9 breaths (41 s) with bolus washin. Mean end-washin inspired CO_2 was 1.6% (closed) and 1.3% (bolus).
Conclusion: Closed circuit washin with an effective CO_2 scrubber does not affect washout endpoints in controls, and results in substantial time savings for test completion. No additional delay is required between tests. This can be further improved by using a novel bolus technique to deliver the tracer gas. Testing in patient groups is ongoing. These developments will allow a much quicker MBW test using a portable device.

128 Multiple breath nitrogen washout in adults with cystic fibrosis: a comparison of two commercially available devices

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Background: In healthy subjects, multiple breath nitrogen washout (MBWN2) yields higher LCI values when performed with the Exhalyzer D (Ecomedics, Switzerland) than when using the EasyOne Pro (NDD, Switzerland).
Objective: To compare data obtained using these devices in CF adults.
Methods: CF patients were studied under stable condition. Before spirometry, MBWN2 was performed in duplicate with each device, in random order on the same 1H session (10 min to explain the test, 25 min per device). Agreement between devices was assessed by Bland-Altman plot.
Results: 44 patients (21F; median age: 28.5, IQR 11.5; median FEV1: 76% pr, IQR: 32%) were investigated. While all patients completed the measurements using the NDD, 10 (23%, median FEV1: 55% pr) failed to do it within the 25 min timeframe using EM. Most patients (24/34) expressed a preference towards NDD. On average, LCI (±SD) EM was consistently higher than LCI NDD (13.73±3.63 vs 10±2.46, $p < 0.001$; mean difference: 3.72, 95% CI: 4.46 to 2.98), with a clear bias towards disproportionally higher LCI difference at higher mean values of LCI. As a consequence, mean duration of each measurement was more than twice longer with EM (268 s vs 113 s, $p < 0.001$). Within subjects LCI variability was lower using EM than using NDD (mean CV ± SD: 5.3% ±4.1) vs 8.5% ±6.5, $p = 0.048$). The proportion of patients with normal FEV1 but high LCI was similar with both devices ($p = 0.3$).
Conclusion: In CF adults, LCI obtained using current versions of the NDD or EM are not interchangeable. Measurements with EM are more reproducible, yield higher LCI values and are significantly more time consuming.
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